

Claims

What is claimed is:

5 1. A system for ensuring quality of service in a virtual private network, comprising:

 a logical bearer network, which is formed by connecting label switch paths configured with preserving bandwidth to routers over a basic IP network with multi-protocol label switch,
10 and is dedicated to transmit service data with quality of service requirement; and

 a bearer control network, which is used to maintain the logical bearer network, allocate route for the service, mark priority of the service in the quality of service field of route
15 label corresponding to multi-protocol label switch data packets encapsulated from the service data stream, and route the service data to opposite end via the logical bearer network in accordance with the allocated route.

20 2. The system for ensuring quality of service in a virtual private network according to claim 1, wherein the bearer control network comprises centralized resource controllers for managing network resources in the logical bearer network, maintaining network topology of the logical bearer network,
25 performing resource calculation and traffic route selection, sending traffic route indications to the routers, allocating resources and performing access control in the logical bearer network, and maintaining membership information and connectivity information for each virtual private network to
30 implement automatic detection and unilateral configuration of

the membership.

3. The system for ensuring quality of service in a virtual private network according to claim 2, wherein each domain of the logical bearer network is provided with one centralized resource controller; the centralized resource controllers are connected with each other, to exchange topology and resource information of the logical bearer network and routing information of the virtual private network.

4. The system for ensuring quality of service in a virtual private network according to claim 1, wherein the logical bearer network and the bearer control network distribute routes for the virtual private network, maintain membership for the virtual private network, and maintain connectivity between sites in the virtual private network in an out-of-band mode.

5. The system for ensuring quality of service in a virtual private network according to claim 2, wherein the routers comprise: provider edge routers, intermediate transfer routers, and core routers; wherein

the provider edge routers are used to identify the virtual private network with quality of service requirement, encapsulate service data with quality of service requirement entering from the virtual private network with label stack designated by the centralized resource controller, set quality of service field of all labels in the label stack in accordance with the service priority, and transmits encapsulated service data packets via the logical bearer network;

the intermediate transfer routers are used to implement

static or dynamic configuration of label switch paths, DiffServ-aware multi-protocol label switch, and stream processing by type of service;

the core routers are used to implement DiffServ-aware multi-protocol label switch and stream processing by type of service.

6. The system for ensuring quality of service in a virtual private network according to claim 2, wherein the centralized resource controller comprises an interface management module, a protocol processing module, a membership maintenance module, a topology and resource management module, a route management module, and an automatic signaling detection module; wherein

the interface management module is used to implement and manage the communication interface between the virtual private network and an external device;

the protocol processing module is used to process protocols for communication between the centralized resource controller and an external device, and forward the data to the membership maintenance module, topology and resource management module, route management module, and automatic signaling detection module in accordance with the protocol; the protocol processing module receives/sends data via the interface management module;

the membership maintenance module is used to maintain the membership information of the virtual private network and connectivity information between sites of the virtual private network;

the topology and resource management module is used to manage the topological relationship and resources of the logical bearer network;

the route management module is used to manage the routing relation of the virtual private network; and

the automatic signaling detection module is used to detect changes automatically, and notify the membership maintenance module and the topology and resource management module to correct the corresponding information.

7. A method for ensuring quality of service in a virtual private network, comprising the steps of:

A. in a basic IP network, constructing a logical bearer network dedicated to transmit service data with quality of service requirement by configuring label switch paths with preserved bandwidth with multi-protocol label switch;

B. providing a centralized resource controller to centrally manage resources of the logical bearer network; and

C. if service data with quality of service requirement is to be transmitted, marking priority of the service in the quality of service field of the routing label stack corresponding to the multi-protocol label switch data packets encapsulated from the service data stream, and routing the service data to the opposite end via the logical bearer network in accordance with the route allocated by the centralized resource controller.

8. The method for ensuring quality of service in a virtual private network according to claim 7, further comprising the following step between step B and step C: the centralized resource controller calculating and issuing access paths between the sites to the routers of virtual private network, so that the routers can store the routes allocated by the

centralized resource controller.

9. The method for ensuring quality of service in a virtual private network according to claim 7, wherein the route is a
5 serial label switch path determined by the label stack.

10. The method for ensuring quality of service in a virtual private network according to claim 7, wherein in the step C, the quality of service field of all labels in the service route
10 label stack is set as the same value.

11. The method for ensuring quality of service in a virtual private network according to claim 7, further comprising the step of: adjusting the topology and resources of the logic
15 bearer network dynamically with multi-protocol label switch traffic engineering.

12. The method for ensuring quality of service in a virtual private network according to claim 7, wherein in the step C, the priority of the service is determined by type of the service.
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13. The method for ensuring quality of service in a virtual private network according to claim 7, further comprising the steps of:

25 determining whether both the service data receiving and sending sites have a quality of service requirement; if yes, transmitting the service data with resources in the logical bearer network; otherwise transmitting the service data with other resources in the basic IP network.

14. The method for ensuring quality of service in a virtual private network according to claim 13, further comprising the following step before the step of determining whether both the service data sending sites and receiving sites have a quality
5 of service requirement:

comparing route targets of the sending sites and receiving sites, and determining whether the connectivity between the sending sites and receiving sites is a general connectivity; if so, proceeding to the next step; otherwise terminating the
10 process.

15. The method for ensuring quality of service in a virtual private network according to claim 13, wherein the step of determining whether both the service data receiving and sending
15 sites have a quality of service requirement is performed in the following way: determining whether the connectivity between the receiving and sending sites is a connectivity with quality of service requirement by comparing the route targets of the receiving and sending sites; if yes, determining the service
20 between the sending sites and receiving sites has a quality of service requirement; otherwise determining the service between the receiving and sending sites has no quality of service requirement.

25 16. The method for ensuring quality of service in a virtual private network according to claim 7, wherein the route allocated by the centralized resource controller to each pair of sites with quality of service requirement is unique.